Executive Summary

Overview

The Advanced Wastewater Treatment System monitoring program was completed using data compiled from January 2005 to December 2005 in accordance with Operational Certificate PE 12212 issued by the Ministry of Water, Land & Air Protection. Additional monitoring and testing of the Wastewater Treatment system was carried out for operational and maintenance purposes. Monthly laboratory results were sent to the Ministry of Water, Land & Air Protection, as well as a yearly report for 2004. As stated in PE 12212 Section 7.2.3 "The first report is due on or before within 60 days of the end of a calendar year for that year's monitoring. [*Sic*]".

Collection System

The gravity sanitary sewer system is maintained by the Works dept. of the City of Penticton. The Wastewater Treatment Div. looks after the ten Lift stations that collect the sewage from the gravity system and they then pump the sewage to the Wastewater Treatment Plant on Waterloo Ave.

The Lift station system had one major change this year, and that was the completion of the wireless communication system that replaced an aging modem system.

Lift Station Goals & Objectives completed for 2005 included:

- Completion of Lift station operational manuals. Increased emergency liability protection.
- A wireless communication upgrade completed. Savings of $3,600.00 per year eliminates line charges.
- Replacement of a Cross connection control device at the Fairview Lift Station. Increased safety of the potable water supply.
- The completion of fall protection at all lift stations. Allows for single operator inspections.

Lift Station Goals & Objectives planned for 2006 include:

- Commissioning of new Wilson St. Lift station.
- Purchase spare pump for Lee Ave. Lift station.
- Repair exterior wall at Alberni Ave. Lift station.
- Landscaping for Fairview Liftstation.

Raw Wastewater

In 2005 the Advanced Wastewater Treatment Plant (AWWTP) received 5,060 Million Litres (ML) of influent from the sanitary sewer system. Compared to 2004's influent flow of 5,326 ML, this was a 5.0% decrease. This decrease in flow may be the result of the Cities initiative in water conservation. The 2005 average daily influent flow rate was

13.9 ML/day. The average influent flow rate per person was 420 litres/day/person, based on the 2005 Penticton population estimate of 33,061 people (from 1996-2005 BC Stats) www.bcstats.gov.bc.ca/data/pop/pop/mun/Mun9605a.htm.

Sanitary Influent Monitoring (EMS # 0500232)[1] to Advanced Wastewater Treatment System					
Parameter[2]	PE 12212 Sampling Frequency Requirements	WWTP Sampling Frequency	PE 12212 Parameter Values for 0500232	2005 Influent Quality Data	# of Tests
Yearly Averaged Flow	N/A	Daily	N/A	13.9 ML/day	365
5 day Biochemical Oxygen Demand (BOD)	N/A	Twice Monthly	N/A	240 mg/l	20
Chemical Oxygen Demand (COD)	N/A	Three Times Per Week	N/A	357 mg/l	148
Total Suspended Solids (TSS)	N/A	Weekly	N/A	230 mg/l	48
Total Phosphorus as P	Monthly	Twice Monthly	N/A	6.3 mg/l	26
Ortho Phosphorus	Monthly	Weekly	N/A	2.9 mg/l	49
Total Nitrogen as N[3]	Monthly	Twice Monthly	N/A	33.5 mg/l	26
Ammonia Nitrogen	N/A	Weekly	N/A	21.4 mg/l	46
Nitrate Nitrogen	N/A	Weekly	N/A	0.9 mg/l	46
Total Kjeldahl Nitrogen	N/A	Twice Monthly	N/A	32.5 mg/l	26
pH	Monthly	Weekly	N/A	7.7	49

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE 12212

[2] Unless otherwise stated, Parameter values are yearly averages.

[3] Influent Total Nitrogen (mg/L) = Monthly Average TKN + Monthly Average NO_3^- + NO_2^-

Table 1 – Sanitary Influent Monitoring (EMS #0500232), Advanced Wastewater Treatment System

Table 1 was compiled using the parameters set out by the Ministry of Water, Air & Land Protection. These parameters are found in Operational Certificate PE 12212, which regulates the AWWTP operational activities (issued March 20, 1995).

The sanitary influent values have not changed significantly from 1998 to 2005, and are typical of raw sewage. The influent flow rate from 1994 to 2005 shows a steady increase of flow between 1994 and 1997 to 4,993.9 ML, with the flow remaining roughly the same from 1997 to 2005.

The issues to be dealt with in 2006 are as follows; Negotiations with the Penticton Indian band to possibly treat their Wastewater, completing and implementing the Liquid Waste Management Plan for the City of Penticton and construction of a septage waste receiving facility at the WWTP.

Treatment Plant

The Plant in 2005 has returned to its historic levels of Phosphorus and Nitrogen removal. 2004 posed some challenges with phosphorous removal, as the aeration system was upgraded to fine air. It took time for the plant staff to optimize the aeration system.

Treatment Plant Goals & Objectives completed for 2005 included:

- Liquid Waste Management 75 % completed. Targeted completion April 2006.
- A new 5 year sludge hauling tender was awarded. Long term contract at similar cost's as 2004.
- A three year training plan for staff was initiated.
- Installation of Halogen emergency shut off valves for the Chlorine and Sulphur Dioxide systems.
- Contaminated site remediation work. Two site inspections and tracking activities.
- 13 out of 14 capital upgrade projects planned this year were completed (See section 2.4.1. of main report)
- Several staff led innovations were put into place. See **2.4.2**

Treatment Plant Goals & Objectives planned for 2006:

- Implement the LWMP recommendations by starting with a preliminary design of the WWTP upgrade option that was chosen as part of the LWMP process in 2005 and 2006.
- Continue with the annual equipment upgrading program that is set out in the budget, which is designed to maintain reliable and efficient operation of the WWTP.
- Continue with odor reduction, working down to the smaller odor generators.
- Complete the aeration automation for the bioreactors which will increase energy savings and add additional process stability.
- Continue to introduce new technology into the Treatment systems which will then help to produce safe waters.
- Design of the septage receiving facility for the WWTP.
- Support the direction from council for the sewer connection of the Penticton Indian band areas into the WWTP.
- Complete a value analyses on any new major wastewater system upgrades from the LWMP.
- Maintain a full complement of staff to help support operation activities during the year in which larger capital projects are proposed.
- Meet the divisional performance measures that are set for the WWTP.

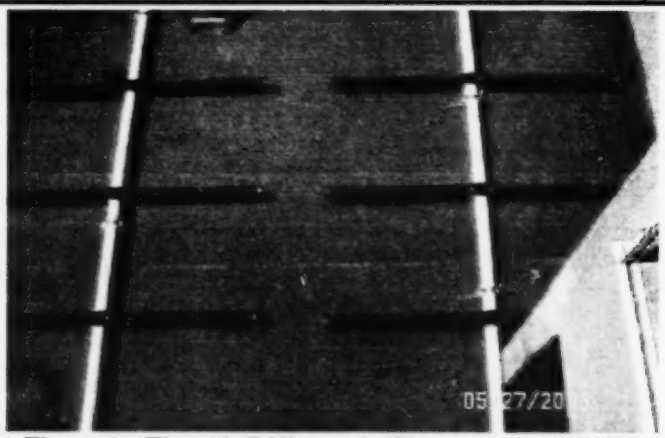

Figure 1 – Fine Air Diffusers in Bioreactor - AWWTP

Effluent discharge to Okanagan River Channel

In 2005 the AWWTP discharged 4,410 Million Litres (ML) of effluent to the Okanagan river channel. The AWWTP average effluent discharge flow to the Okanagan river channel in 2005 was 12.1 ML/day, compared to an average effluent discharge flow to the Okanagan river channel of 12.1 ML/day in 2004. The total effluent flow to the Okanagan river channel has remained steady from 1994 to 2005, with yearly variations being attributed to fluctuations in irrigation from year to year.

Discharge Effluent Monitoring (EMS #E105000) [1] from Advanced Wastewater Treatment System						
Parameter [2]	**PE 12212 Sampling Frequency Requirements**	**WWTP Sampling Frequency**	**PE 12212 Parameter Values for E105000**	**2005 Effluent Quality Data**		**# of Tests**
Maximum One-day Flow	Daily	Daily	< 18.2 ML/day	17.0	ML/day (July 20)	365
Yearly Averaged Flow	Daily	Daily	< 15.5 ML/day	12.1	ML/Day	365
Maximum Monthly Averaged Flow	Daily	Daily	< 16.5 ML/day	13.7	ML/day (Nov.)	365
5 day Biochemical Oxygen Demand (BOD	Monthly	Twice Monthly	< 10 mg/l	<5	mg/l	16
Chemical Oxygen Demand (COD)	Daily	Daily	N/A	39	mg/l	361
Total Suspended Solids (TSS)	Monthly	Weekly	< 10 mg/l	1.0	mg/l	52
Total Phosphorus as P Not to exceed	310	Daily	< 2.0 mg/l	0.47	mg/l (Aug 5)	302
Total Phosphorus as P 99 percentile [3]	237.5	Daily	< 1.5 mg/l	0.32	mg/l	302
Total Phosphorus as P 90 percentile [4]	Weekly	Daily	< 1.0 mg/l	0.219	mg/l	302
Total Phosphorus as P Annual Average	Weekly	Daily	< 0.25 mg/l	0.11	mg/l	302
Total Phosphorus as P Level to Strive for	Weekly	Daily	<.01 mg/l			302
Ortho Phosphorus	Daily	Daily	N/A	0.04	mg/l	365
Total Nitrogen as N	Weekly	Daily	< 6.0 mg/l	**5.2**	**mg/l**	299
Ammonia Nitrogen	Weekly	Daily	N/A	0.39	mg/l	348
Nitrate Nitrogen	Weekly	Daily	N/A	3.9	mg/l	358
Total Kjeldahl Nitrogen	N/A	Daily	N/A	1.27	mg/l	313
Total Chlorine residual immediately prior to dechlorination	Continuously	Daily [6]	> 0.5 mg/l	**0.85**	**mg/l**	365
Total Chlorine residual after dechlorination	Continuously	Daily [6]	< 0.0 mg/l	**0.00**	**mg/l**	365
Total Coliforms	Weekly	Weekly	N/A	13.5	MPN	53
Fecal Coliforms	Weekly [7]	Weekly	< 50 MPN	**4.2**	**MPN**	53
pH	Daily	Daily	N/A	7.2		314

Bold Items Indicate an exceeding of Permit Parameters

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE

[2] Unless otherwise stated, Parameter values are yearly averages.

[3] 99 percentile means one of a set of points on a scale arrived at by dividing a group into parts in order of magnitude. For example, a score equal to or greater than 99 percent of those attained on an examination is said to be in the 99th percentile.

[4] 90 percentile means one of a set of points on a scale arrived at by dividing a group into parts in order of magnitude. For example, a score equal to or greater than 90 percent of those attained on an examination is said to be in the 90th percentile.

[5] Effluent Total Nitrogen (mg/L) = Average(Daily TKN + Daily NO3- + NO2-)

[6] A chlorine meter is used continuously to control Chlorine dosing. A second chlorine meter reads total chlorine residual before de-chlorination.

[7] Increasing to daily if an analysis of over 50 MPN Fecal Coliform is recorded during the summer season.

Table 2 – Discharge Effluent Monitoring (EMS #E105000), Advanced Wastewater Treatment Plant

Table 2 was compiled using the parameters set out by the Ministry of Water, Air & Land Protection. These parameters are found in Operational Certificate PE 12212, which regulates the AWWTP operational activities (issued March 20, 1995).

Effluent Irrigation to Parks & Golf Course

Effluent irrigation in 2005 was 441 ML total flow, compared to 425 ML in 2004. Irrigation took place between April 20th and Oct. 26th, 2005. Two city parks, Kings & Queens, as well as the Penticton Golf & Country club receive effluent for irrigation purposes. Historic irrigation flows vary from year to year due to several factors; precipitation, increases in irrigation acreage, length of the growing season, etc.

Okanagan River Channel Monitoring

Receiving water impact monitoring is required under PE 12212. The Upstream Monitoring location (EMS# 0500050) is located at the Coyote Cruises loading site near Okanagan Lake. The Downstream Monitoring location (EMS# 0500050) is located at the river off landing upstream of Shingle creek. For details see **2.3.4.**

As for the AWWTP, in 2005 the only time that fecal coliforms exceeded 50 MPN was June 1st (70 MPN). We re-sampled June 3rd and the results were back within permit (2 MPN). The yearly average was 4 MPN, and the effluent fecal coliform count was lower than the Upstream (12 MPN) and Downstream (18 MPN) Fecal coliform count.

Operating Certificate PE 12212 Violations

Total Nitrogen discharges in the effluent exceeded the parameter level of 6.0 mg/l 62 days in 2005. Last year we were over 109 times, the improvement can be contributed to the reduced DO levels in the last cell of the bioreactor. The yearly average discharge for Total Nitrogen was 5.2 mg/l. This is an ongoing situation the plant has had for a number of years. The bioreactor cannot physically recycle enough flow from the end of the bioreactor to the anoxic zone for de-nitrification. The Ministry of Water, Land & Air Protection is aware of this, but is more concerned with the Phosphorus discharge than the Nitrogen discharge, because Phosphorus is the limiting factor for algal growth in the lake discharge environment.

Even though the average Total Chlorine level in the effluent prior to de-chlorination was above the permit level of 0.5 mg/l, there were three occasions in 2005 when the Chlorine level was below 0.5 mg/l. Total Chlorine level prior to de-chlorination yearly average was 0.85 mg/l. Total Chlorine level after de-chlorination yearly average was 0.005 mg/l, with grab samples indicating that the parameter of 0.00 mg/l was exceeded 11 times. (See section **2.4.2.2**. for compliance solutions)

The average Total Chlorine residual level in the irrigation system was 2.0 mg/l, above the permit level of 1.0 mg/l. There were 18 occasions in 2005 when the daily average Chlorine levels were below 1.0 mg/l. (See section **2.4.2.3**. for compliance solutions)

For the Irrigation system, the annual average Fecal Coliform of .7 MPN was less than the 2.2 MPN parameter and there were three occasions in 2005 when the test results exceeded 2.2 MPN. (See sections **2.4.2.2.** and **2.4.2.3.** for compliance solutions)

PE 12212 Section 3.3.4 states the City must "Designate a 'Chief Operator', certified at a Class IV level by December 1, 1998". The AWWTP currently has; one (1) Operator III (Administration) with his level IV, one (1) Operator III (Process) with his level III, two (2) Operator II's with their level I's and one (1) Operator I with his O.I.T. The Ministry of Water, Land and Air Protection is aware of this arrangement.

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Appendix A **Maps Of Lift Stations And Irrigation Areas; Aerial Photo Of Advanced Wastewater Treatment Plant**

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Appendix C **Operational Certificate PE 12212**

1. Collection system

The City of Penticton's sanitary sewer collection and treatment system consists of 151.3 km of gravity and force main sanitary sewer pipes, which services the entire city and the Penticton airport. There are two main Lift stations; the Lee Ave Lift station services the south part of the city, the Alberni St. Lift station services the north part of the city. As well, there are 8 additional smaller lift stations located throughout Penticton. The majority of the sewage collected by the sanitary system flows by gravity to these Lift stations, where it is then pumped by force mains to the AWWTP located at 459 Waterloo Ave. (see Map A.1.). Some parts of central Penticton's sewage flows directly by gravity service to the AWWTP.

1.1. Lift station Report

All 10 of the Lift stations are inspected once a week by AWWTP staff. Stations are monitored 24 hrs/day by a remote telemetry system. A computerized maintenance system is used to monitor servicing intervals for the various pumps, valves, generators, etc. that are found at each lift station.

1.1.1. Lee Avenue Lift station

The Lee Ave. Lift station is located at the corner of Lee Ave. and Parkview St. in Skaha Park. Sanitary sewage flows by gravity from the south end of Penticton into this station. It also receives sewage from the 3 lift stations along East Side Rd., as well as the Airport Lift station flow. Lee Ave Lift station consists of a wet well area, a separate control room and dry well. In the dry well there are two 60 hp Fairbanks Morse Pumps, each rated at 80 Litres/sec and there are provisions to install a third pump in the future as increasing flows warrant. In the control room there is a back up generator to supply power to the station in the event of a power outage. An enzyme degreaser program was run for the 2005 year, due to the build-up of grease on the walls of the wet well. This program continues to provide excellent results and has shown no effect on plant performance.

Figure 2 – Lee Ave. Lift station

1.1.2. Alberni Street Lift station

The Alberni St. Lift station is located on Alberni St. behind the Trade and Convention Centre. Sanitary sewage flows by gravity from the north end of Penticton into this station. It also receives sewage from the 2 lift stations along Marina Way Rd. Alberni Lift station consists of two sections. The first section is the wet well, which contains three 60 hp Myers Pumps rated at 73 Litres/sec. The second section, the control room, contains the control equipment, plus a back up generator to supply power to the station in the event of a power outage. Pump # 3 was completed rebuilt this year.

Figure 3 – Alberni St. Lift station

1.1.3. Lift station Repairs & Modifications

A communications upgrade started in 2004 and was completed March of 2005. The upgrade will incorporate wireless radio technology, to replace aging telephone communication system, resulting in a more reliable, less costly system of communication.

As part of the City of Penticton Cross Connection Control Program, the new installation of a backflow preventer was completed at Fairview Lift station.

One pump was rebuilt this year; pump #3 pump at Alberni St. ($2,368.18)

To meet WCB standards for fall protection, all Lift station hatches and openings will either have railing or netting installed. This project started in November of 2004 and was completed at the end of March 2005.

1.1.4. Planned Projects for 2006

Purchase a spare pump for Lee Ave. The current station has only two pumps and the need for redundancy is critical as the growth in the south end of town continues.
Alberni St. requires repairs one exterior wall.
Install ultrasonic level measurement at Airport to replace flygt bulbs.

1.2 Sanitary Sewer System Report

1.2.1 2005

1.2.1.1 Sanitary Sewer Repairs & Modifications

The major upgrading project in 2005 was the commencement of installation of sanitary sewers in the industrial area. The PIDA project at (Page Avenue and Commercial Way) as part of the industrial area upgrades. Pickering Street sewer main was upgraded from manhole 789 to manhole 788.

1.2.1.2 The Sanitary Lining Tender 2005

The tender for the lining project was awarded to Insituform Technologies Limited for the price of $ 157,600.30. The areas lined were on Penticton Avenue, a lane west of Ontario Street and Creekside Road, which was a distance of 658.6 meters. 104.2 meters of extra lining was done on McDougall Avenue and Front Street.

1.2.1.3 Root Inhibitor Program 2005

The root inhibitor program used for 2005 was Root X and root cutting. The cost for the Root X was $13, 590.00. The crew incorporated the Root X into the sanitary lines and services. After 4 months a review of the lines took place and from that review streets and areas were removed from the list for next year, because of the excellent results that were found. For locations of Root X and root cutting refer to Sanitary Sewer Maintenance 2005 on page 4.

1.2.1.4 2005 Grease Cleaning Program

The sanitary lines that were cleaned were on Comox Street, Forbes Street, Wylie Street, Westminster Ave, Skaha Lake Road, Columbia Street, Wade Ave, Green Ave West, Blairmore Street, Nanaimo Avenue, Abbott Street, Lakeshore Driveand Evergreen Drive.

1.2.1.5 2005 Sanitary Video Inspection

Approximately 12 km of the sanitary lines and services in the city were inspected by video in 2005. The sanitary video program is set up to rotate on a 10 year cycle, where every section of sanitary line will be inspected during those years. The tender for the video inspection went to Ray Smith Services. For the locations refer to Sanitary Video Inspection 2005 on page 7.

1.2.1.6 Service Interruptions

There were three service interruptions in the city right of way. All were caused by roots and occurred on Pickering Street, South Main Street and Penticton Avenue.

1.2.1.7 Main Interruptions

The main interruption that occurred in 2005 was on Abbott Street. It was caused by a backup in the line and was within the road right of way.

1.2.1.8 Maintenance Data Collection

A new data collection system was implemented in 2005. The system, Infrastructure Repairs, collects data when maintenance is done on sanitary main lines and services in the city. The system records if the line had a problem caused by roots, grease, backups or if it needs to be lined.

1.2.2 2006

1.2.2.1 Planned Projects for 2006

Sanitary Sewer lining- $90, 000 – under review.

1.2.2.2 Sanitary Maintenance 2006

Flushing of approximately 55 km of sanitary main lines and services is planned for 2006. The areas where grease accumulates will be cleaned and the Root X and root cutting program has been changed based on the information gathered from 2005. Various streets and areas have been removed or added to ensure the roots are taken care of. To see locations refer to Sanitary Sewer Maintenance 2006 on page 5.

1.2.2.3 Sanitary Video 2006

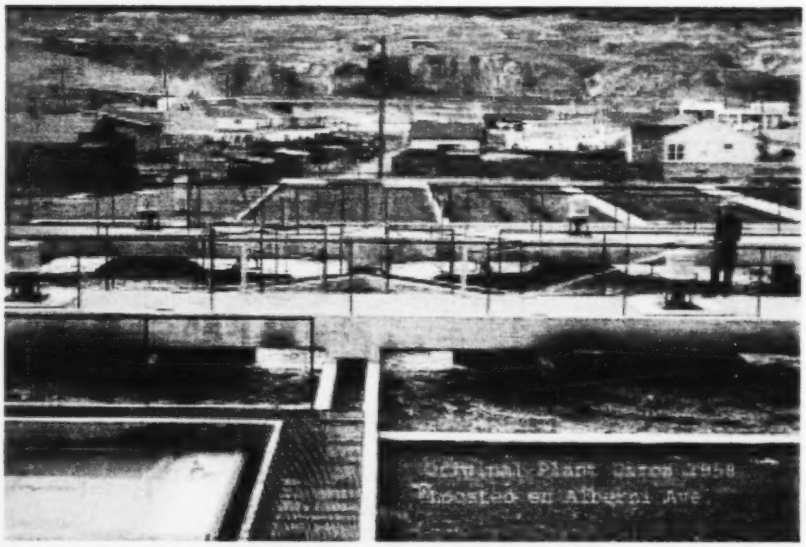
The video inspection for 2006 will cover approximately 17 km of sanitary main lines and services. To see locations for 2006 refer to Sanitary Video Inspection 2006 on page 8. From the video inspection information review, the lining project for 2007 will be produced.

1. Advanced Wastewater Treatment Plant

Figure 4 – AWWTP Entrance Sign

The City of Penticton's Advanced Wastewater Treatment Plant is located at 459 Waterloo Ave. (Appendix a Photo A.2). The plant staff includes one (1) Wastewater Operator I, two (2) Wastewater Operator II's, two (2) Wastewater Operator III's, two (2) Millwrights, one (1) Electrician, and the Wastewater Supervisor.

2.1. History



Sewage treatment started in Penticton in 1948 with a Package Primary / Secondary plant at what is now the Alberni Lift station. The existing plant location has had a Secondary Activated Sludge Treatment Plant since 1960, with a design capacity of 5.5 ML/d. In 1970, the plant capacity was increased to 8.2 ML/d with construction of additional primary and secondary clarifiers, plus chemical coagulation facilities for phosphorus removal. Between 1970 –1985, a number of improvements and increases to the plant's treatment capacity were made to cope with increasing wastewater flows and loads. In 1985 the BC Waste

Management Branch prepared a report which reviewed the requirements for discharge of municipal effluents to the Okanagan Lake system. It was determined continued surface discharge of treated effluent to Okanagan Lake, Okanagan River and Skaha Lake would be possible, provided advanced tertiary treatment was implemented to ensure high quality effluent. The report recognized that land application proposals would also require advanced tertiary treatment.

Stanley & Associates Engineering Ltd. completed a Wastewater Management Plan for the City in 1987, and was subsequently commissioned by the City to provide design, construction management and plant commissioning services for a new Advanced Wastewater Treatment Plant (AWWTP). The new and expanded AWWTP, with biological nutrient removal, was constructed and commissioned in the fall of 1990. The plant is designed to treat 18.2 ML/d with a hydraulic capacity of 36.2 ML/d. After the plant was commissioned, an optimization study was conducted that showed a capacity up to 28.0 ML/day is available. The BC Ministry of Environment paid for 75 percent of the cost of the new facility through the Okanagan Water Quality Control Project.

2.2. Physical Works

The AWWTP system is made up of the following six sub-systems.

2.2.1. Headwork's & Primary Treatment

Headwork's & Primary treatment consist of the following: three Archimedes screw pumps, mechanical bar screen, Pista de-gritter, six rectangular primary clarifiers, two flow equalization basins and two sludge fermenters to supplement the phosphorous removal process. The existing digesters from the old activated sludge process are now used for Fermenter sludge digesting and some secondary sludge (RAS) digesting.

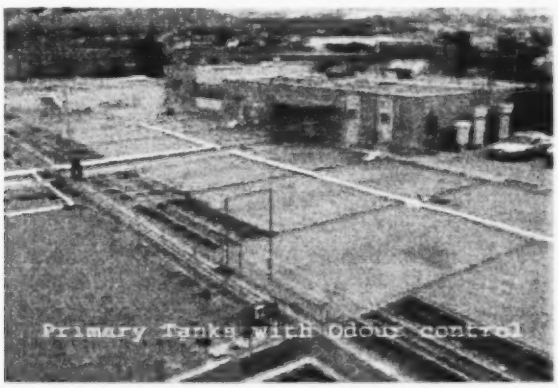


Figure 5 – Primary Clarifier Tanks

Table 3 compares raw wastewater test results from 2005 to the previous five years. These parameters are set out by the Ministry of Water, Air & Land

Protection for influent monitoring (EMS # 0500232) and are found in Operational Certificate PE 12212, which regulates the Advanced Wastewater Treatment Plant Operational Activities (issued March 20, 1995)

Sanitary Influent Comparison (EMS # 0500232)[1] 2000 to 2005 Advanced Wastewater Treatment System															
Parameter[2]	PE 12212 Sampling Frequency Requirements	WWTP Sampling Frequency	PE 12212 Parameter Values for 0500232	2005 Influent Quality Data		2004 Influent Quality Data		2003 Influent Quality Data		2002 Influent Quality Data		2001 Influent Quality Data		2000 Influent Quality Data	
Yearly Averaged Flow	N/A	Daily	N/A	13.9	ML/day	14.6	ML/day	13.7	ML/day	13.3	ML/day	13.2	ML/day	13.2	ML/day
5 day Biochemical Oxygen Demand (BOD)	N/A	Twice Monthly	N/A	240	mg/l	252	mg/l	240	mg/l	250	mg/l	252	mg/l	224	mg/l
Chemical Oxygen Demand (COD)	N/A	Three Times Per Week	N/A	357	mg/l	367	mg/l	369	mg/l	349	mg/l	346	mg/l	332	mg/l
Total Suspended Solids (TSS)	N/A	Weekly	N/A	230	mg/l	208	mg/l	247	mg/l	208	mg/l	223	mg/l	207	mg/l
Total Phosphorus as P	Monthly	Twice Monthly	N/A	6.31	mg/l	6.4	mg/l	6.9	mg/l	6.0	mg/l	6.5	mg/l	5.1	mg/l
Ortho Phosphorus	Monthly	Weekly	N/A	2.91	mg/l	2.7	mg/l	2.9	mg/l	2.9	mg/l	3.1	mg/l	3.0	mg/l
Total Nitrogen as N [3]	Monthly	Twice Monthly	N/A	33.5	mg/l	33.3	mg/l	35.5	mg/l	33.8	mg/l	33.5	mg/l	30.7	mg/l
Ammonia Nitrogen	N/A	Weekly	N/A	21.4	mg/l	20.9	mg/l	20.5	mg/l	21.0	mg/l	20.4	mg/l	20.7	mg/l
Nitrate Nitrogen	N/A	Weekly	N/A	0.93	mg/l	1.1	mg/l	1.2	mg/l	1.3	mg/l	1.3	mg/l	1.2	mg/l
Total Kjeldahl Nitrogen	N/A	Twice Monthly	N/A	32.5	mg/l	32.3	mg/l	34.3	mg/l	32.4	mg/l	32.5	mg/l	29.4	mg/l
pH	Monthly	Weekly	N/A	7.7		7.6		7.6		7.6		7.6		7.7	

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE 12212

[2] Unless otherwise stated, Parameter values are yearly averages.

[3] Influent Total Nitrogen (mg/L) = Monthly Average TKN + Monthly Average NO_3^- + NO_2^-

Table 3 - Sanitary Influent Comparison (EMS # 0500232), 2000 to 2005, Advanced Wastewater Treatment System

The only parameter that has changed significantly over the past six years in Table 3 has been the annual average yearly influent flow. From 2000 to 2005 the flow has increased from 13.34 ML/day (1999) to 14.6 ML/day (2005). All other parameters have held steady, and are typical of raw wastewater.

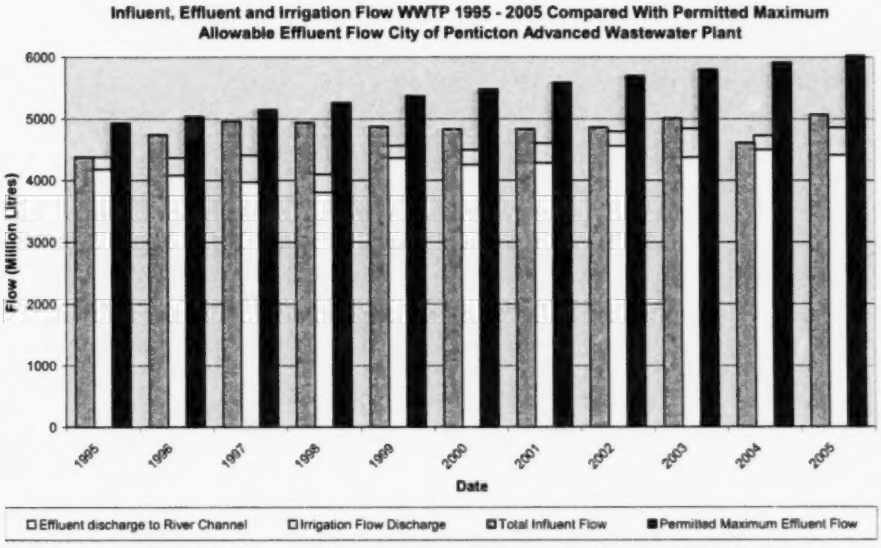


Chart 1 - Total Influent Flow to WWTP 1995 - 2005

Chart 1 compares the total influent flow to the combined irrigation & effluent flows, as well as the permitted maximum effluent flow. The total influent flow is below the permitted maximum effluent flow for every year, and has not increased while the permitted maximum effluent flow has increased every year.

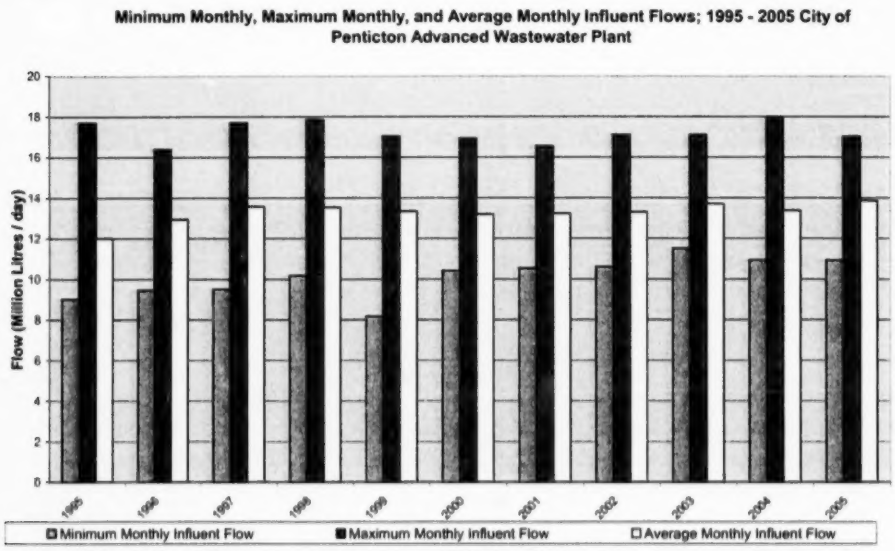


Chart 2 - Minimum, Maximum Influent Monthly Average Flows and Permitted Monthly Maximum Average Effluent Flow to WWTP 1995 - 2005

Chart 2 shows that from 1997 to 2005, the average monthly influent flow held steady, while the difference between the maximum monthly and minimum monthly flows decreased slightly. This may indicate that the winter to summer population fluctuation each year was less pronounced.

2.2.2 Secondary & Tertiary Treatment

Secondary & Tertiary treatment consists of biological phosphorous and nitrogen removal, based on the modified University of Capetown (UCT) process. Primary clarifier effluent enters the first part of the bioreactor known as the anaerobic stage. Here biomass recycled from the secondary clarifiers is mixed with the primary clarifier effluent and the supernatant from the fermenters. This mixture is known as Mixed Liquor Suspended Solids (MLSS). Phosphorus is released by the MLSS as it uptakes the Volatile Fatty Acids from the fermenter supernate.

The second part of bioreactor, called the anoxic stage, is where recycled MLSS from the third stage of the bioreactor is mixed back in with the MLSS from the anaerobic stage. Typical recycle rates are around 3 times the influent rate. The biomass then strips oxygen from the nitrates in the recycled MLSS to begin consuming organic waste, converting the ammonia to nitrate, and reabsorbing the phosphorus that was released in the anaerobic stage. In the process the nitrogen gas left over after the oxygen has been stripped away from the nitrates escapes from the bioreactor as nitrogen gas.

In the third or aerobic stage, air is bubbled through the MLSS to allow the MLSS to finish consuming the remaining organic material as well as removing almost all of the phosphorus. The majority of the ammonia is also converted to nitrates. At the end of the aerobic stage, three times the influent flow rate is sent back to the anoxic stage. The rest of the flow goes on to the secondary clarifiers. Here MLSS is gravity separated into a thicker biomass called Return Activated sludge (RAS), and secondary effluent. The RAS is returned to the anaerobic stage of the bioreactor, with some of it being sent to the belt filter press for de-watering and then composting at the landfill. The secondary effluent is then sent through sand filters as a final polishing step. The plant has the capability of chemical addition of alum, ferric chloride and sodium acetate to augment the biological process system in times of a plant upset.

Bioreactors.

Figure 6 - Bioreactors

2.2.3 Disinfection Method

Disinfection consists of chlorination using compressed chlorine gas and three chlorine contact tanks followed by de-chlorination with Sulphur Dioxide. This leaves an effluent that is free of pathogenic organisms and is safe for discharge to Okanagan River Channel, or for use as irrigation. The Chlorination system used an average of 64 kg/day of Chlorine gas and 19 kg/day of Sulfur Dioxide gas in 2005

2.2.4. Sludge Conditioning & Composting

Sludge Conditioning & Composting consists of the primary sludge being fermented and then treated by anaerobic digesters. The amount of gas (about 40% methane) produced by the digesters in 2005 was 206,658 cubic meters. Of that amount, 139,435 cubic meters were used for plant building heating and sludge process heating using a boiler system. The 67,223 cubic meters of surplus gas were burned off to the atmosphere using a candle burner. Potentially, this excess gas could be used for expanded heating at the Wastewater plant, or it could be utilized to generate electrical power. Previous studies have shown that utilizing

surplus gas was uneconomical, but newer technologies, such as microturbines and fuel cells, may make surplus methane utilization possible.

Return Activated Sludge (RAS), from the Secondary treatment system, is thickened in a settling tank (2% solids), gravity belt thickened (6%), belt filter press de-watered (13%) and then composted at our landfill compost site. Composting is by static pile aeration method, which produces a Class A biosolids. This conditioning / fertilizing product is recycled to City Parks, landscapers, the public and orchardists for agriculture use. In 2005, the Wastewater plant sent 634 truckloads of sludge to the compost facility, for a total volume of 5977 cubic meters.

Figure 7 – Anaerobic Digesters

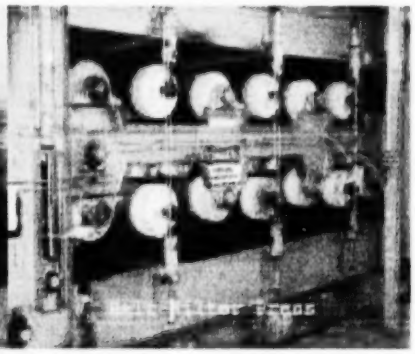


Figure 8 – Belt Filter Press

2.2.5. Odor Control Systems

Two types of systems control plant odours. Odours are removed from the concrete covered fermenters, the fabric covered primary / equalization tanks by a positive displacement blower discharging into the bioreactor aeration system. The Headworks area, digester hoppers and degrit building have odours removed by activated carbon canisters systems

2.2.6. Instrumentation & Control Systems

The Supervisory Control and Data Acquisition (SCADA) system consists of Intouch Wonderware software, controlled through Modicon programmable logic controllers. The software was updated in November of 2005, version9.5 and a new PC along with a new Modbus Plus card was installed to run the new software. The plant and lift station alarms are connected by a wireless radio system. The Alarms are monitored after hours by the Fire-hall dispatchers. One operator is required to be on call every day of the year.

Figure 9 – Control Room

2.3. Treated Effluent

Treated effluent from the AWWTP is discharged to the Okanagan River Channel. In addition, during the spring/summer/fall, it is used to irrigate the Penticton Golf course and two City parks. Quality parameters discussed for the effluent apply to both Okanagan River Channel discharge flow and Irrigation flow. Effluent is discharged based on the Ministry of Water, Land & Air Protection's Operational Certificate PE 12212.

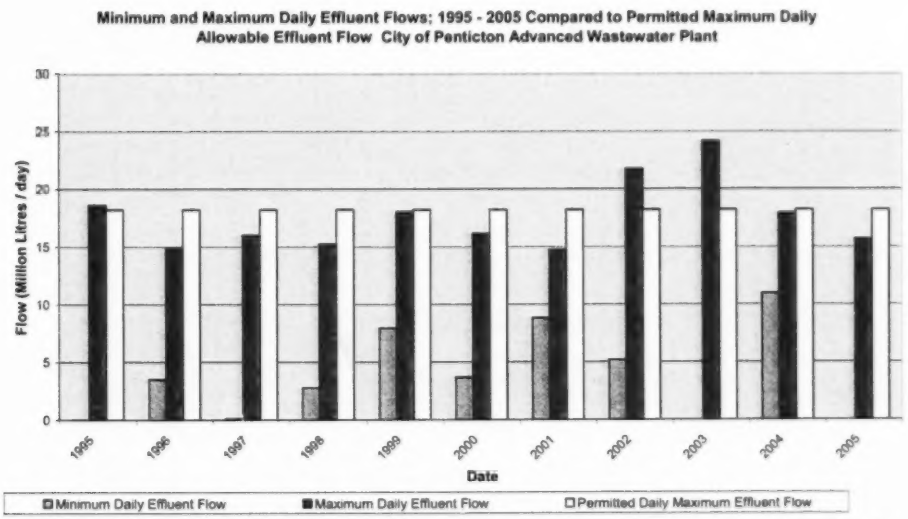


Chart 3-Minimum & Maximum Daily Effluent Flow Compared to Permitted Maximum Daily Effluent Flow Chart 1995 – 2005

Chart 3 is showing the minimum & maximum daily effluent flow to the Okanagan River Channel. The minimum daily values reflect the fact that some operations at the Wastewater plant use effluent flow (i.e. filling some tanks, diverting effluent flow to storage ponds, etc.) The maximum daily flow values seen, particularly 2002 and 2003, reflect problems we were having with the effluent flow meter itself. The unit has since been rebuilt and is operating to within 10 % of the influent flow meter. The influent flow meter is a parshall flume with ultrasonic level control. The effluent meter is a probe inserted into a partially full pipe measuring velocity and depth.

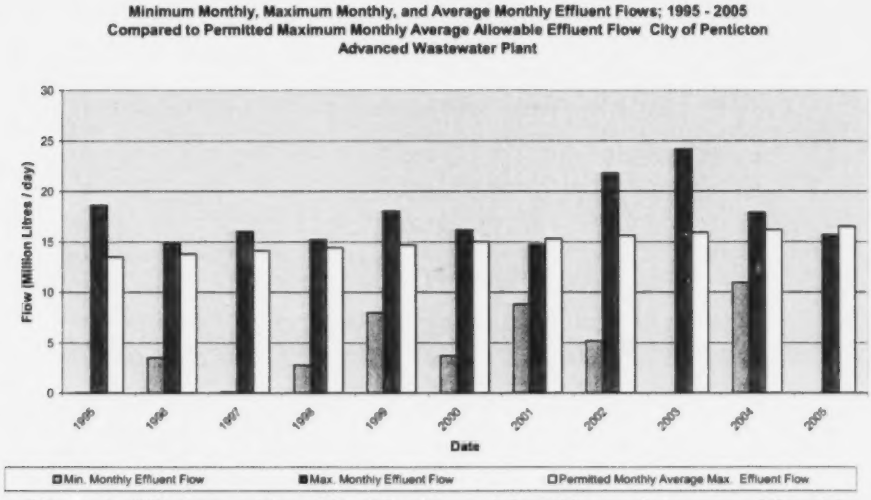


Chart 4 - Minimum Monthly, Maximum Monthly, and Average Monthly Effluent Flows Compared to Permitted Maximum Monthly Average Allowable Effluent Flow; 1995 – 2005

As with Chart 3, Chart 4 minimum and maximum monthly values have been distorted by internal plant process modifications, and instrument error.

Discharge Effluent Comparison (EMS #E105000), 1 2000 to 2005, Advanced Wastewater Treatment System

Parameter [2]	PE 12212 Sampling Frequency Requirements	WWTP Sampling Frequency	PE 12212 Parameter Values for E105000	2005 Effluent Quality Data		2004 Effluent Quality Data		2003 Effluent Quality Data		2002 Effluent Quality Data		2001 Effluent Quality Data		2000 Effluent Quality Data	
Maximum One-day Flow	Daily	Daily	< 18.2 ML/day	15.7	ML/day (June 17th)	16.6	ML/day (Aug. 23rd)	15.6	ML/day (Aug. 8th)	15.0	ML/day (Aug. 2nd)	15.2	ML/day (July 23rd)	15.8	ML/day (Aug. 8th)
Yearly Averaged Flow	Daily	Daily	< 15.5 ML/day	12.1	ML/Day	12.0	ML/Day	12.5 [3]	ML/Day	12.6 [3]	ML/Day	12.3 [3]	ML/Day	12.5 [3]	ML/Day
Maximum Monthly Averaged Flow	Daily	Daily	< 16.5 ML/day	13.7	ML/day (Nov.)	14.2	ML/day (Aug.)	14.3	ML/day (Aug.)	13.7	ML/day (Aug.)	13.7	ML/day (Aug.)	14.3	ML/day (Aug.)
5 day Biochemical Oxygen Demand (BOD	Monthly	Twice Monthly	< 10 mg/l	<5	mg/l	<5	mg/l	2.2	mg/l	2.0	mg/l	3.1	mg/l	2.2	mg/l
Chemical Oxygen Demand (COD)	Daily	Daily	N/A	39	mg/l	44	mg/l	38	mg/l	35	mg/l	35	mg/l	38	mg/l
Total Suspended Solids (TSS)	Monthly	Weekly	< 10 mg/l	1.0	mg/l	1.6	mg/l	0.7	mg/l	0.7	mg/l	0.7	mg/l	0.8	mg/l
Total Phosphorus as P Not to exceed (Maximum one day total)	Weekly	Daily	< 2.0 mg/l	0.47	mg/l (August 5)	**2.3**	**mg/l (April 21&22)**	**2.2**	**mg/l (Oct. 27)**	0.36	mg/l (June 15th)	1.4	mg/l (May 30th)	1.6	mg/l (July 10th)
Total Phosphorus as P 99 percentile [4]	Weekly	Daily	< 1.5 mg/l	0.32	mg/l	**1.7**	**mg/l**	1.32	mg/l	0.13	mg/l	0.92	mg/l	1.13	mg/l
Total Phosphorus as P 90 percentile [5]	Weekly	Daily	< 1.0 mg/l	0.22	mg/l	0.53	mg/l	0.28	mg/l	0.10	mg/l	0.16	mg/l	0.20	mg/l
Total Phosphorus as P Annual Average	Weekly	Daily	< 0.25 mg/l	0.11	mg/l	**0.25**	**mg/l**	0.17	mg/l	0.07	mg/l	0.12	mg/l	0.15	mg/l
Total Phosphorus as P Level to Strive for	Weekly	Daily	<.01 mg/l												
Ortho Phosphorus	Daily	Daily	N/A	0.04	308	0.17	308	0.13	mg/l	0.03	mg/l	0.07	mg/l	0.07	mg/l
Total Nitrogen as N [6]	Weekly	Daily [7]	< 6.0 mg/l	5.2	mg/l	**6.0**	**mg/l**	**6.2**	**mg/l**	**4.7**	**mg/l**	**6.3**	**mg/l**	**6.1**	**mg/l**
Ammonia Nitrogen	Weekly	Daily	N/A	0.39	mg/l	0.47	mg/l	0.18	mg/l	0.14	mg/l	0.50	mg/l	0.46	mg/l
Nitrate Nitrogen	Weekly	Daily	N/A	3.9	mg/l	4.5	mg/l	5.2	mg/l	3.8	mg/l	5.0	mg/l	4.7	mg/l
Total Kjeldahl Nitrogen	N/A	Daily	N/A	1.27	mg/l	1.39	mg/l	1.02	mg/l	0.91	mg/l	1.30	mg/l	1.30	mg/l
Total Chlorine residual immediately prior to dechlorination	Continuously	Daily	> 0.5 mg/l	0.85	mg/l	**0.80**	**mg/l**	**0.74** [8]	**mg/l**	**0.72** [8]	**mg/l**	N/A		N/A	
Total Chlorine residual after dechlorination	Continuously	Daily	< 0.0 mg/l	0.00	mg/l	**0.01**	**mg/l**	**0.01** [8]	**mg/l**	**0.01** [8]	**mg/l**	**0.0** [8]	**mg/l**	**0.0** [8]	**mg/l**
Total Coliforms	Weekly	Weekly	N/A	13	MPN	10.6	MPN	9.5	MPN	76.0	MPN	36.0	MPN	29.4	MPN
Fecal Coliforms	Weekly [9]	Weekly	< 50 MPN	4	MPN	**2.3**	**MPN**	**1.0**	**MPN**	**89.0**	**MPN**	2.4	MPN	1.2	MPN
pH	Daily	Daily	N/A	7.2		7.1		7.2		7.3		7.3		7.2	

Bold Items Indicate an exceeding of Permit Parameters

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE 12212

[2] Unless otherwise stated, Parameter values are yearly averages.

[3] Yearly average flows were calculated by subtracting the irrigation total flow from the influent total flow. This is because of the problems that the effluent flow meter had in 2003.

[4] 99 percentile means one of a set of points on a scale arrived at by dividing a group into parts in order of magnitude. For example, a score equal to or greater than 99 percent of those attained on an examination is said to be in the 99th percentile.

[5] 90 percentile means one of a set of points on a scale arrived at by dividing a group into parts in order of magnitude. For example, a score equal to or greater than 90 percent of those attained on an examination is said to be in the 90th percentile.

[6] Every year, the effluent Total N exceeds 6.0 mg/l on several occasions.

[7] Effluent Total Nitrogen (mg/L) = Average(Daily TKN + Daily NO3- + NO2-)

[8] A chlorine meter is used continuously to dose Chlorine into the Chlorine Contact tank. In 2005 a second chlorine analyzer was installed prior to de-chlorination. 1999-2003 daily grab samples were taken at the end of the tank, prior to dechlorination.

[9] Increasing to daily if an analysis of over 50 MPN Fecal Coliform is recorded during the summer season.

Table 4 - Discharge Effluent Comparison (EMS #E105000), 1999 to 2005, Advanced Wastewater Treatment System

Table 4 compares results from 2005 to the previous five years. The parameters are set out by the Ministry of Water, Air & Land Protection for effluent monitoring (EMS #E105000) in Operational Certificate PE 12212.

The most noticeable difference is the increase in phosphorus levels for 2004. One factor that may have led to this increase was the installation of the fine aeration system in July of 2003. The use of fine air led to the establishment of different operating parameters, and during this learning period the plant was not run as effectively as before. In 2005 the plant has returned to its historic nutrient removal levels.

Another factor that began at this time was a struvite recovery pilot project that was set up at the WWTP by the University of British Columbia and Stantec Inc. and ran from June to December 2003. This Struvite recovery system removes phosphorus, ammonia, and manganese from the secondary anaerobic digester to create a crystal fertilizer (struvite). Extensive piping changes allowed thickened RAS sludge to be pumped over to the digester, thus saving money on sludge hauling to the compost site. The supernate from the secondary anaerobic digester was sent through the struvite extraction process, producing a high quality fertilizer. Not all of the digester supernate could be treated, resulting in higher than normal levels of phosphorus recycled back to the headworks of the plant.

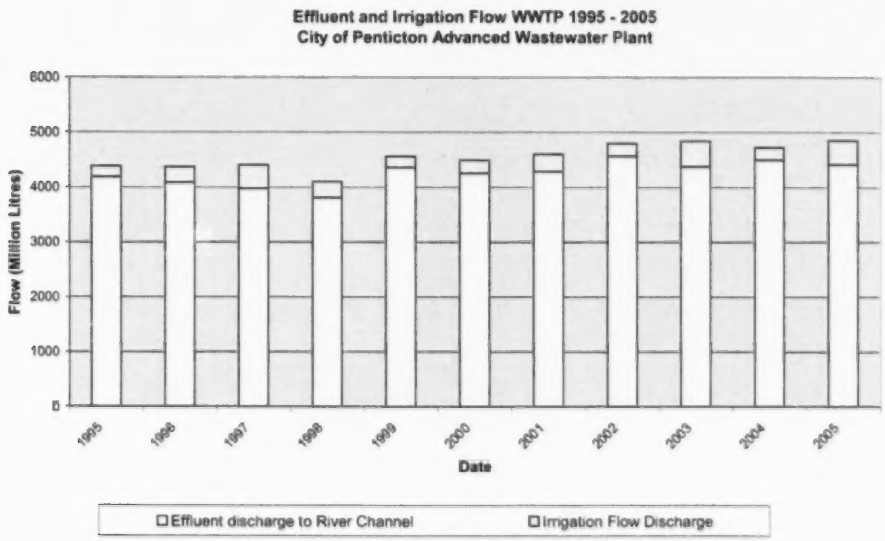


Chart 5 – Stacking Bar Chart of Effluent Flow to the Okanagan River Channel and Irrigation Flow 1995 to 2005

Chart 5 shows the combined flow levels of the Okanagan River Channel discharge, and the Irrigation flow levels. This shows the percentage of irrigation flow compared to the total effluent flow.

2.3.1. Okanagan River Diffuser Outfall

Treated effluent is discharged through an under-water diffuser system into the Okanagan river channel adjacent to the plant site. In 2005 the treatment plant sent 4,410 ML total flow to Okanagan River Channel, or 12.1 ML/day.

Figure 10 – Outfall Diffuser Location

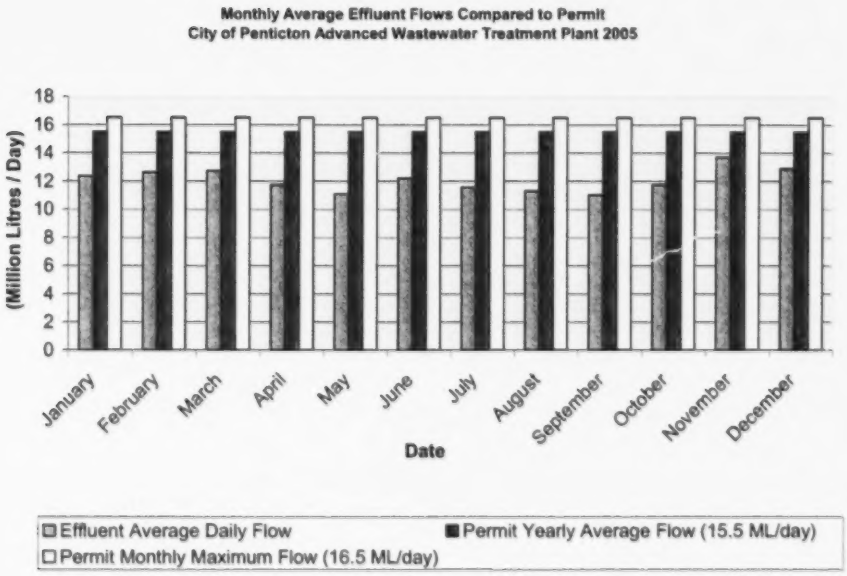


Chart 6- Monthly Average Effluent Flows Compared to Permit

Chart 6 shows that the average monthly flow is well within permit level of 15.5 ML/day at all times of the year.

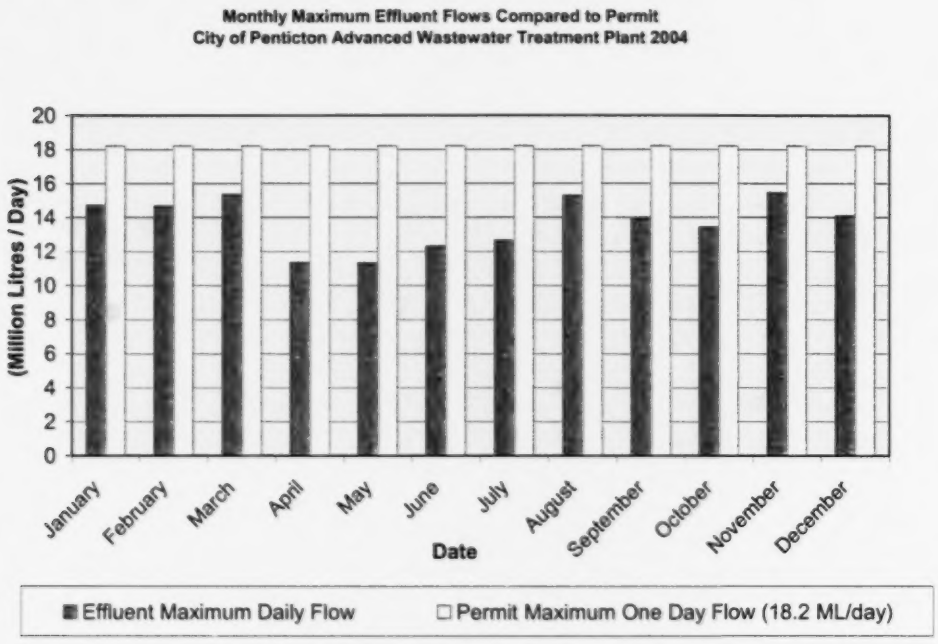


Chart 7 – Maximum Daily Effluent Flow Compared to Permitted Maximum Daily Effluent Flow

Chart 7 shows that the maximum daily flow for each month is well under the permitted maximum allowable flow of 18.2 ML/day. The highest daily flow (15.7 ML/day) occurred on June 17th.

2.3.2. Effluent Irrigation System

Irrigating with the effluent is done by three 60 hp 8 stage vertical turbine pumps. Maximum pumping capacity is approximately 100 l/sec. In 2005 441 ML went out for Irrigation, accounting for 12 % of the total plant flow. The city currently irrigates the Penticton Golf and Country Club (29.1 hectares); King's Park (5.1 hectares) and Queens Park (4.5 hectares) for a total of 38.7 hectares (see Appendix A Map A.3.).

Figure 11 – Kings Park

Figure 12 – Queens Park

Effluent Irrigation Monitoring (EMS# E221689) [1] from Advanced Wastewater Treatment System					
Parameter [2]	PE 12212 Sampling Frequency Requirements	Irrigation Sampling Frequency	PE 12212 Parameter Values for E221689	2005 Effluent Irrigation Quality Data	# of Tests
Total Yearly Flow	Continuously	Continuously	N/A	440.82 ML	365
Average Daily Flow [3]	Continuously	Continuously	N/A	1.2 ML/day	365
Total Chlorine residual	Continuously	Daily	> 1.0 mg/l	**1.60 mg/l**	188
Total Coliforms	Weekly	Weekly	N/A	13.2 MPN	22
Fecal Coliforms	Weekly	Weekly	< 2.2 MPN	**0.7 MPN**	22
pH	Daily	225	N/A	7.2	314
Bold Items Indicate an exceeding of Permit Parameters					
[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air protection for PE					
[2] Unless otherwise stated, Parameter values are yearly averages.					
[3] Flow is averaged over whole year, not just irrigation period.					
For all other parameters about effluent irrigation, see "Discharge Effluent Quality from Advanced Wastewater Treatment System" Data table					

Table 5 – Effluent Irrigation Monitoring (EMS #E221689), Advanced Wastewater Treatment System

Table 5 shows that two parameters were in violation of PE 12212. The Total Chlorine residual was under the minimum of 1.0 mg/l 18 times in 2005. The other parameter that was in violation, the Fecal coliform level, was over permit three times.

Table 6 compares results from 2005 to the previous five years, following the parameters set out by the Ministry of Water, Air & Land Protection for irrigation effluent monitoring (EMS# E221689). These parameters are found in Operational Certificate PE 12212, which regulates the AWWTP operational activities (issued March 20, 1995).

Table 6 – Effluent Irrigation Comparison (EMS #E221689), 1999- 2005, Advanced Wastewater Treatment System

Effluent Irrigation Comparison (EMS# E221689), 1 2000 to 2005 Advanced Wastewater Treatment System										
Parameter [2]	PE 12212 Sampling Frequency Requirements	Irrigation Sampling Frequency	PE 12212 Parameter Values for E221689	2005 Effluent Irrigation Quality Data	2004 Effluent Irrigation Quality Data	2003 Effluent Irrigation Quality Data	2002 Effluent Irrigation Quality Data	2001 Effluent Irrigation Quality Data	2000 Effluent Irrigation Quality Data	1999 Effluent Irrigation Quality Data
Total Yearly Flow	Continuously	Continuously	N/A	440.8 ML	425.0 ML	419.98 ML	238.39 ML	323.11 ML	242.90 ML	198.26 ML
Average Daily Flow [3]	Continuously	Continuously	N/A	1.2 ML/day	1.2 ML/day	1.15 ML/day	0.65 ML/day	0.89 ML/day	0.67 ML/day	0.51 ML/day
Total Chlorine residual [4]	Continuously	Daily	> 1.0 mg/l	**1.6 mg/l**	**1.1 mg/l**	**0.98 mg/l**	**0.83 mg/l**	**0.89 mg/l**	**0.58 mg/l**	**0.47 mg/l**
Total Coliforms	Weekly	Weekly	N/A	13.2 MPN	10.8 MPN	8.2 MPN	28.7 MPN	36.2 MPN	16.4 MPN	11.9 MPN
Fecal Coliforms	Weekly	Weekly	< 2.2 MPN	**0.7 MPN**	**0.5 MPN**	**1.0 MPN**	**2.9 MPN**	**3.3 MPN**	**0.3 MPN**	**0.5 MPN**
pH	Daily	Daily	N/A	7.2	7.1	7.2	7.3	7.3	7.2	7.3

Bold Items Indicate an exceeding of Permit Parameters

[2] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE 12212

[3] Unless otherwise stated, Parameter values are yearly averages.

[4] Flow is averaged over whole year, not just irrigation period.

[5] A chlorine analyzer is used continuously to dose Chlorine into the Chlorine Contact tank. Daily grab samples are taken at the intake to the irrigation pumping system.

For all other parameters about effluent irrigation, see "Discharge Effluent Quality from Advanced Wastewater Treatment System" Data table

Table 6 shows that 2005 had the most irrigation flow compared to the previous four years. The average Total Chlorine residual level in the irrigation system was 2.0 mg/l above the permitted value of 1.0 mg/l, but there was 18 occasions in 2005 when the grab samples indicated that the Chlorine level was below 1.0 mg/l. Even though the average Fecal Coliform of .7 MPN (Most Probable Number) was less than the 2.2 MPN parameter, there was three occasions in 2005 when the test results exceed 2.2 MPN.

2.3.3. Effluent Storage Pond

In case of a plant upset, treated or untreated sewage can be stored in two emergency on-site 36 ML storage basins. Stored sewage can then be returned by gravity to the Headworks of the plant for treatment.

2.3.4 Okanagan River Channel

The Okanagan River Channel is eight kilometers long and connects Okanagan Lake to Skaha Lake. The Advanced Wastewater Treatment Plant effluent is discharged into Okanagan River Channel approximately 400 meters north of Green Mountain Rd. Effluent is diffused into the channel through a 200 mm Outfall pipe, which splits into 6 diffuser heads and these heads are spaced evenly across the river channel. Signs posted on both banks of the channel mark the pipe location.

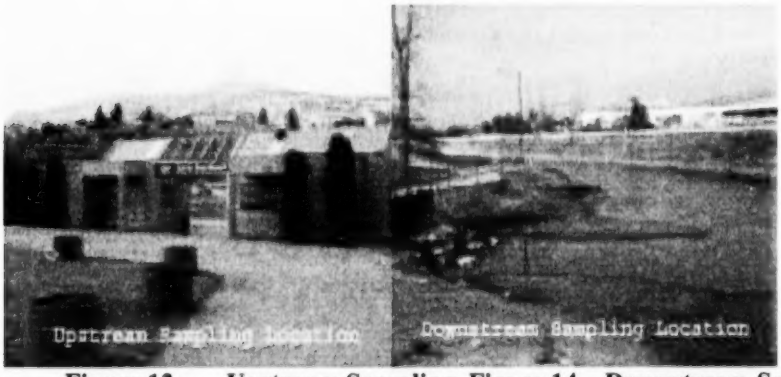


Figure 13 – Upstream Sampling Location **Figure 14 – Downstream Sampling Location**

Upstream sampling occurs at the Coyote Cruises loading site on Riverside Rd. (EMS# 0500050) as well as 200 meters upstream of the Outfall. The reason we sample 200 meters above the Outfall is that the upstream permit location is 2 km from the Outfall and many factors could affect the permit levels. Should any downstream values exceed the permit, we can cross check these values against the Coyote Cruise location.

The Downstream Monitoring location (EMS# 0500050) is located at the river off landing upstream of Shingle Creek.

Okanagan River Channel Upstream Surface Water Impact monitoring (EMS# 0500050) [1]						
Parameter [2]	PE 12212 Sampling Frequency Requirements	Upstream Sampling Frequency	PE 12212 Parameter Values for 0500050	2004 Upstream Quality Data Average		# of Tests
Total Suspended Solids (TSS)	Monthly	Monthly	N/A	0.8	mg/l	12
Total Phosphorus as P	Monthly	Monthly	N/A	0.03	mg/l	12
Ortho Phosphorus	Monthly	Monthly	N/A	0.02	mg/l	12
Total Nitrogen as N	Monthly	Monthly	N/A	0.36	mg/l	12
Ammonia Nitrogen	Monthly	Monthly	N/A	0.06	mg/l	12
Nitrate Nitrogen	Monthly	Monthly	N/A	0.11	mg/l	12
Total Kjeldahl Nitrogen	N/A	Monthly	N/A	0.25	mg/l	12
Total Coliforms	Monthly	Monthly	N/A	58.2	MPN	12
Fecal Coliforms	Monthly	Monthly	N/A	20.2	MPN	12
pH	Monthly	Monthly	N/A	8.2		12

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for

[2] Unless otherwise stated, Parameter values are yearly averages.

Table 7 - Okanagan River Channel Upstream Surface Water Impact monitoring (EMS #0500050)

Table 7's results are typical of water bodies in the Okanagan. Coliform counts come from a variety of non-point sources, like wildlife, storm water runoff, etc. Samples are collected once a month.

Okanagan River Channel Downstream Surface Water Impact monitoring (EMS# E221464) [1]						
Parameter [2]	PE 12212 Sampling Frequency Requirements	Downstream Sampling Frequency	PE 12212 Parameter Values for E221464	2004 Downstream Quality Data (Average)		# of Tests
Total Suspended Solids (TSS)	Monthly	Monthly	N/A	1.0	mg/l	12
Total Phosphorus as P	Monthly	Monthly	N/A	0.03	mg/l	12
Ortho Phosphorus	Monthly	Monthly	N/A	0.02	mg/l	12
Total Nitrogen as N	Monthly	Monthly	N/A	0.33	mg/l	12
Ammonia Nitrogen	Monthly	Monthly	N/A	0.07	mg/l	12
Nitrate Nitrogen	Monthly	Monthly	N/A	0.13	mg/l	12
Total Kjeldahl Nitrogen	N/A	Monthly	N/A	0.22	mg/l	12
Total Coliforms	Monthly	Monthly	N/A	118.3	MPN	12
Fecal Coliforms	Monthly	Monthly	N/A	22.0	MPN	12
pH	Monthly	Monthly	N/A	7.8		12

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE 12212

[2] Unless otherwise stated, Parameter values are yearly averages.

Table 8 - Okanagan River Channel Downstream Surface Water Impact monitoring (EMS #E221464)

Okanagan River Channel Upstream Surface Water Impact monitoring [1]					
Parameter [2]	PE 12212 Sampling Frequency Requirements	Downstream Sampling Frequency	PE 12212 Parameter Values for E221464	2005 Upstream Quality Data (Average)	# of Tests
Total Suspended Solids (TSS)	N/A	Monthly	N/A	1.3 mg/l	12
Total Phosphorus as P	N/A	Monthly	N/A	0.04 mg/l	12
Ortho Phosphorus	N/A	Monthly	N/A	0.02 mg/l	12
Total Nitrogen as N	N/A	Monthly	N/A	0.36 mg/l	12
Ammonia Nitrogen	N/A	Monthly	N/A	0.06 mg/l	12
Nitrate Nitrogen	N/A	Monthly	N/A	0.12 mg/l	12
Total Kjeldahl Nitrogen	N/A	Monthly	N/A	0.24 mg/l	12
Total Coliforms	N/A	Monthly	N/A	127.9 MPN	12
Fecal Coliforms	N/A	Monthly	N/A	16.2 MPN	12
pH	N/A	Monthly	N/A	8.2	12

[1] This location is 200 meters upstream from our outfall. The reason we sample 200 meters above the Outfall is that the upstream permit location is 2 km from the Outfall and many factors could affect the permit levels. Should any downstream values exceed the permit, we can cross check these values against the Coyote Cruise location.

[2] Unless otherwise stated, Parameter values are yearly averages.

Table 9 - Okanagan River Channel Upstream Surface Water Impact monitoring

There are two parameters, total and fecal coliforms, that are higher in the downstream testing results compared to the upstream testing results. There are a variety of reasons why this would be so. One might be storm water runoff into Okanagan River Channel. The second could be wildlife feces.

Tables 10 and 11 compare results from 2005 to the previous five years. The parameters are set out by the Ministry of Water, Air & Land Protection for the Okanagan River Channel. These parameters are found in Operational Certificate PE 12212, which regulates the AWWTP operational activities (issued March 20, 1995).

Except for the coliform data mentioned above, every other parameter that was measured shows that the downstream samples were equal to or superior to the upstream samples. This shows that the Wastewater Treatment plants effluent has a negligible effect of the Okanagan River Channel water quality.

Table 10 – Okanagan River Channel Upstream Surface Water Comparison (EMS #0500050), 1999 - 2005

Okanagan River Channel Upstream Surface Water Comparison (EMS# 0500050), 1 2000 to 2005										
Parameter [2]	PE 12212 Sampling Frequency Requirements	Upstream Sampling Frequency	PE 12212 Parameter Values for 0500050	2005 Upstream Quality Data	2004 Upstream Quality Data	2003 Upstream Quality Data	2002 Upstream Quality Data	2001 Upstream Quality Data	2000 Upstream Quality Data	1999 Upstream Quality Data
Total Suspended Solids (TSS)	Monthly	Monthly	N/A	0.8 mg/l	0.8 mg/l	0.8 mg/l	0.6 mg/l	0.6 mg/l	0.6 mg/l	0.6 mg/l
Total Phosphorus as P	Monthly	Monthly	N/A	0.04 mg/l	0.03 mg/l	0.03 mg/l	0.02 mg/l	0.03 mg/l	0.03 mg/l	0.04 mg/l
Ortho Phosphorus	Monthly	Monthly	N/A	0.02 mg/l	0.02 mg/l	0.03 mg/l	0.02 mg/l	0.02 mg/l	0.02 mg/l	0.02 mg/l
Total Nitrogen as N	Monthly	Monthly	N/A	0.35 mg/l	0.36 mg/l	0.37 mg/l	0.32 mg/l	0.38 mg/l	0.51 mg/l	0.35 mg/l
Ammonia Nitrogen	Monthly	Monthly	N/A	0.05 mg/l	0.06 mg/l	0.04 mg/l	0.03 mg/l	0.03 mg/l	0.03 mg/l	0.03 mg/l
Nitrate Nitrogen	Monthly	225	N/A	0.11 mg/l	0.11 mg/l	0.11 mg/l	0.10 mg/l	0.11 mg/l	0.20 mg/l	0.12 mg/l
Total Kjeldahl Nitrogen	0	237	N/A	0.24 mg/l	0.25 mg/l	0.27 mg/l	0.22 mg/l	0.27 mg/l	0.30 mg/l	0.26 mg/l
Total Coliforms	0	212	N/A	34.5 MPN	58.2 MPN	26.0 MPN	160.1 MPN	378.0 MPN	92.9 MPN	105.8 MPN
Fecal Coliforms	Monthly	199	N/A	11.9 MPN	20.2 MPN	15.3 MPN	18.2 MPN	51.5 MPN	14.8 MPN	15.9 MPN
pH	Monthly	298	N/A	8.2	8.2	7.9	8.2	8.1	8.0	8.2

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE 12212

[2] Unless otherwise stated, Parameter values are yearly averages.

Okanagan River Channel Downstream Surface Water comparison (EMS# E221464),1 2000 to 2005												
Parameter[2]	PE 12212 Sampling Frequency Requirements	Upstream Sampling Frequency	PE 12212 Parameter Values for E221464	2005 Downstream Quality Data	2004 Downstream Quality Data	2003 Downstream Quality Data	2002 Downstream Quality Data	2001 Downstream Quality Data	2000 Downstream Quality Data	1999 Downstream Quality Data
Total Suspended Solids (TSS)	Monthly	Monthly	N/A	1.1 mg/l	1.0 mg/l	1.0 mg/l	0.6 mg/l	0.8 mg/l	0.8 mg/l	1.2 mg/l
Total Phosphorus as P	Monthly	Monthly	N/A	0.03 mg/l	0.03 mg/l	0.03 mg/l	0.02 mg/l	0.02 mg/l	0.04 mg/l	0.04 mg/l
Ortho Phosphorus	Monthly	Monthly	N/A	<0.02 mg/l	0.02 mg/l	0.02 mg/l	0.02 mg/l	0.02 mg/l	0.02 mg/l	0.02 mg/l
Total Nitrogen as N	Monthly	Monthly	N/A	0.36 mg/l	0.33 mg/l	0.36 mg/l	0.32 mg/l	0.45 mg/l	0.53 mg/l	0.40 mg/l
Ammonia Nitrogen	Monthly	Monthly	N/A	0.05 mg/l	0.07 mg/l	0.04 mg/l	0.03 mg/l	0.04 mg/l	0.03 mg/l	0.03 mg/l
Nitrate Nitrogen	Monthly	225	N/A	0.12 mg/l	0.13 mg/l	0.15 mg/l	0.10 mg/l	0.16 mg/l	0.21 mg/l	0.14 mg/l
Total Kjeldahl Nitrogen	0	237	N/A	0.23 mg/l	0.22 mg/l	0.22 mg/l	0.22 mg/l	0.30 mg/l	0.29 mg/l	0.27 mg/l
Total Coliforms	0	212	N/A	120.6 MPN	118.3 MPN	113.6 MPN	160.1 MPN	921.5 MPN	164.7 MPN	161.2 MPN
Fecal Coliforms	Monthly	199	N/A	18.0 MPN	22 MPN	27.4 MPN	18.2 MPN	12.0 MPN	14.8 MPN	15.5 MPN
pH	Monthly	298	N/A	8.2		7.9	8.2	8.0	8.0	8.1

[1] EMS is the "Environmental Monitoring System" numbers set up by the Ministry of Water, Land & Air Protection for PE 12212

[2] Unless otherwise stated, Parameter values are yearly averages.

Table 11 – Okanagan River Channel Downstream Surface Water Comparison (EMS #E221464), 1999 - 2005

2.4 Advanced Wastewater Treatment Plant Completed Projects, Staff Innovations and Planned Projects for 2005

2.4.1. Completed Projects

The following repairs and replacement took place in 2005 for the Advanced Wastewater Treatment Plant:

2.4.1.1. De-nitrification recycle pump replacement. ($20,121.23)
2.4.1.2. Moisture separator installed on odor blower ($8,2051.10)
2.4.1.3. Monyo #1 repairs ($2,441.52)
2.4.1.4. Polymer pump repairs ($1,844.10)
2.4.1.5. Digester sludge pump repairs. ($2,073.54)
2.4.1.6. #3 raw sewage pump repairs ($2,368.18)

Cost's obtained from maintenance departments Managed Maintenance Software.

2.4.2. Staff Innovations

Several staff innovations were carried out at the Wastewater Treatment plant in 2005. These include;

2.4.2.1. Repairs to the screw pump drive, in house by the maintenance staff resulting in a cost savings of approximately $ 10,000.00

2.4.2.2. Repairs to a Monyo sludge pump in house by maintenance staff resulting in $12,000.00 cost savings.

2.4.2.3. Screw pump controls upgraded, provides a greater safety factor for back up screw pump operation, all programming done by electrician in house.

2.4.2.4. Soft start installed on main blowers, allowing blower to start on a prolonged power outage.

2.4.2.5. BCWWA conference two staff members competed in Top Op's challenge taking home first place.

2.4.2.6. Chlorine awareness training. Saving the city liability, as the fire hall was not capable of responding. On site emergency response for Chlorine and Sulphur Dioxide now done by operations staff at the WWTP for the WWTP.

2.4.2.7. Bioreactor Train 2 diffuser maintenance and inspection.

2.4.3. Planned Projects for 2006

The Wastewater plant has $90,000.00 budgeted this year for equipment repair/replacement. The following projects are scheduled:

		Est. Cost
2.4.3.1.	Replace De-nitrification Recycle	$22,000
2.4.3.2.	VFD for recycle pump	$5,000
2.4.3.3.	Replace one set of gas detectors	$5,000
2.4.3.4.	Purchase two spare rotorks	$12,000
2.4.3.5.	Replace hand held DO meter	$2,000
2.4.3.6.	Communications line to Dig.	$1,000
2.4.3.7.	A/C for the press office	$5,000
2.4.3.8.	3" de-watering pump	$4,000
2.4.3.9.	HVAC Control Bldg.	$8,000
2.4.3.10	Chemical hose replacement	$2,000